VOL. I. Ser. A. Part 5.—pp. 137—176. MAY, 1913.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES A: AGRICULTURAL.

ISSUED BY THE IMPERIAL
BUREAU OF ENTOMOLOGY.

LONDON:

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IMPERIAL BUREAU OF ENTOMOLOGY.

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Head Office.—British Museum (Natural History), Cromwell Road, London, S.W.

Publication Office.—27, Elvaston Place, London, S.W.

O'Kane (W. C.). **Injurious insects. How to recognise and control them.** Macmillan Co., New York, 1912, 414 pp., 606 figs. Price 8*s*. 6*d*. net (2 $).

The insect pests described in this book are arranged in three groups as follow:—(1) Pests of garden and field crops, including pests of green-houses; (2) pests of orchards and small fruits; (3) pests of household, or stored products, and of domestic animals; this group comprises the common injurious species that do not feed on living plants.

Within each of the first two groups the species are arranged according to the place where they are found at work, thus insects within the soil are treated of first; then borers found within the stem, trunk or limb; then the pests feeding on the surface of the stem or trunk; then the leaf-feeders, and finally the insects attacking the flower or fruit. Many leaf-feeding insects are again grouped according to their general characteristics; caterpillars, sucking-bugs, etc., and the page headings are arranged so as to serve as an index to the place where the insect is found at work, and its general characteristics. The author has endeavoured so far as possible to avoid the duplication which is inevitable if an attempt be made to group pests according to host-plants. Fifty-one pages of the book with fifty-five illustrations are devoted to a general description of insects, their mode of spread, and their natural enemies.

Part II is devoted to means of control, and contains numerous formulae for insecticides in general use and methods of repelling insects from their food-plants. A general description is given of the principles of fumigation with carbon bisulphide, carbon tetrachloride, sulphur, hydrocyanic acid gas, and tobacco, together with the quantities required, and the methods of preparing Bordeaux mixture and lime-sulphur are carefully described. Sixteen pages are devoted to the details of spraying machinery, which is very fully illustrated.

Part III (pp. 107-379) deals with the insects themselves, their mode of operation, methods of control and remedies. As the book is intended primarily for the use of growers, no unnecessary scientific details are given under each insect, but in most cases in which it would be of practical utility, a figure of the insect with its larva is given, together with a photograph showing the nature of the damage done. If rightly used, this portion of the book should be of the greatest possible value to farmers and growers, as giving them at least some preliminary information as to the causes of damage to their crops, directing them as to the general methods by which such damage may be avoided or controlled and stimulating observation. A somewhat too short chapter is devoted to the insect pests of domestic animals. To those who have to deal with the whole subject of injurious insects, the table of references to the publications of the various United States Experiment Stations is extremely valuable.

The index to the book is very full, and as in it the pests are grouped according to the plants affected, there should be no difficulty, even to the uninitiated, in tracing the insect which may be damaging a particular crop.

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The Turnip Mud Beetle (*Helophorus rugosus*).—*Jl. Board Agric., London*, xx, no. 1, April 1913, p. 41.

Sickly turnip plants submitted to the Board for examination were found to be attacked by the larvae of the Turnip Mud Beetle. The edges of the young leaves were eaten, and pieces gnawed out of the upper surface of the swollen base of the leaves close to where they spring from the stem. The larvae were found quite in the heart of the youngest central leaves; these larvae were preserved and were found to bury themselves in the soil provided for them, and there pupated. This fact suggests that the attack of the Turnip Mud Beetle might be usefully followed by deep ploughing.

Bryden (H. A.). **Migratory Locusts.**—*The Field*, 18th Jan. 1913, pp. 139-140.

A short popular account of Migratory Locusts in Asia and Africa, with a description of some of the methods which have been found most useful for destroying them.

Porter (C. E.). **Notas para la Zoologiá Económica de Chile. Adiciones a la lista de los Cóccidos.** [Notes on the Economic Zoology of Chile. Additions to the list of Coccids.] *Rev. Chilena Hist. Nat.*, xvi, 1912, pp. 22 and 23.

Cockerell's catalogue of the Coccidae of South America (Rev. Chilena Hist. Nat., vi, 1902, pp. 250-257) gives only 10 species of Coccids for Chile and that of Fernald published in the following year 11. In the last 10 years most of the common species have been found throughout the country, as well as certain others which appear for the moment, at all events, to be new to Chile. Rivera described a further new species of *Aspidiotus* in 1905 and the author has demonstrated the existence in Chile of *Lepidosaphes ficifolii*, Berl., and *A. cyanophilli*, Sign. This last species was discovered on "Pacay" (*Inga reticulata*) during the author's official journey for the study of *Stegomyia fasciata*, in the valley of Tacna, and it has also been previously observed upon "Chañar" (*Gourliea decorticans*), in the valley of the Copiapó. The author gives the following list of the Coccids at present known in Chile. *Epidiaspis pyricola*, Del.Guer., 1894; *Aspidiotus cyanophilli*, Sign., 1869; *A. nigropunctatus*, Ckll., 1896; *A. osborni*, Curt., 1843; *A. rapax*, Comst., 1881; *A. riverae*, Ckll., 1905; *Aulacaspis rosae*, Bouché, 1834; *Fagisuga triloba*, Lindinger, 1909; *Icerya palmeri*, Riley & Howard, 1890; *Lecanium resinatum*, Kieffer & Herbst, 1909; *Lepidosaphes ficifolii*, Berl., 1903; *L. ulmi*, L., 1758; *L. becki*, Newm., 1869; *Pseudococcus citri*, Risso, 1813; *Pseudoparlatoria chilina*, Lindg., 1908; *Saissetia hemisphaerica*, Targ., 1867.

Newstead (R.). & Cummings (B. F.). **On a remarkable gall-producing Psyllid from Syria.**—*Ann. Mag. Nat. Hist.* (8) xi, 1913, pp. 306-308, 4 figs., 1 pl.

A large, hollow, pod-shaped gall, containing an immense quantity of immature "mealy" Psyllids was found on a twig, probably of a tamarind, at Brumana, in the Lebanon. As only larvae and a few pupae were present, the insect cannot be described as a new species, but only as belonging to the sub-family Triozinae. The size of the gall is characteristic, being larger than that of any known gall-producing Psyllid.

Goot (P. van der). **Über zwei noch unbeschriebene Blattlaus-Arten.** [Two undescribed Aphids.]—*Tijdschrift voor Entomologie, 's Gravenhage*, lv, pt. 4, 24th Feb. 1913, pp. 319-332, 6 figs.

A list of tropical aphids, chiefly Indian, Assamese and Javanese, is followed by a description of two new species collected in Java in November and December 1909. *Macrosiphum orientale*, sp. n., was found on the under side of the leaves of *Blumea balsamifera*, one of the Compositae, at Gunung Ungaran, 2,700 ft. The other new species, *Cerataphis insularis*, was found on a plant, the species of which unfortunately is not recorded, at Semarang.

Bodkin (G. E.). **Report of the Economic Biologist of British Guiana for 1912.** Georgetown, Demerara, 1913, 4 pp.

During the period under consideration a large number of visits were made to cultivations for the purpose of investigating cases of attack by insects. These included pests of sugar-cane, the moth borers (*Castnia licus* and *Diatraea*), the weevil borer (*Sphenophorus hemipterus*), the beetle borers (*Dyscinetus bidentulus* and *D. dubius*), also the sugar-cane mealy bug (*Pseudococcus calceolariae*); pests of rice, such as the rice bug and sundry Lepidopterous larvae; pests of the coconut, such as the palm weevil (*Rhyncophorus palmarum*), and scale-insects (*Aspidiotus destructor*) and others. A number of cases of the bud-rot of the coconut palm were also investigated, as well as pests of rubber, such as Lepidopterous larvae consuming the leaves (mainly the hawk-moth, *Dilophonota ello*), and the attacks of small bark beetles (*Xyleborus perforans*).

The author says that co-operation against insect pests is very necessary; it is useless for one farmer to rid his land of pests if his neighbour allows them to flourish unchecked.

The Black Currant Gall Mite.—*The Field*, 1st Feb. 1913, p. 233; 8th Feb. 1913, p. 275; and 22nd Feb. 1913, p. 379.

The Black Currant Gall Mite (*Eriophyes ribis*) has been known for more than sixty years, and at times in certain districts has

done so much damage as practically to put an end to the commercial cultivation of black currants. Certain varieties, Baldwin and Bashoop Giant, are said to be immune, but this is unfortunately not the case. "Big bud" has been reported on red and white currants, but this is rare.

Hand-picking is successful on small plantations; dusting with unslaked lime and flowers of sulphur at the end of March, mid-April, and the beginning of May gives the best results, but it has been known to fail; smearing the bushes in January and again in April with fish oil or cart-grease also has its advocates.

Hand-picking should be done before the new year, about November or December, when the diseased buds are rounder than the healthy ones and often of a greenish shade instead of a deep red. It is impossible to clear the trees in one picking, for the buds do not all develop the mites at the same time, but one very careful picking in early December, with inspection every three weeks, should in time clear them. All buds must be burned at once and care taken not to infect healthy trees, for the mite may be carried on the clothing from one tree to another.

JOHANNSEN (O. A.). **Insect Notes for 1912.**—*Maine Agric. Expt. Station, Orono*, 14th March 1913, 18 pp., 3 pls., 9 figs.

The author says that these notes deal for the most part with well known insects, but they are reported on because of their significance with reference to local conditions. The past year has been in some ways of unusual entomological interest. Spruce pests have been very troublesome, the Gipsy and Brown-tail Moths have continued to spread, and many scale-insects ordinarily of small account have been conspicuous by their prevalence in many parts of the State. On the other hand beneficial insects have increased. Syrphids and other predaceous insects have practically exterminated many species of plant lice over large areas. The scale-insects dealt with are *Aspidiotus ostreaeformis* (European Fruit Scale), *A. perniciosus* (San José Scale), and *Aulacaspis rosae* (Rose Scale) which is said not to be limited to the rose, but to thrive on pears, strawberries, raspberries and blackberries. In the State of Maine the two last-named were the principal sufferers in 1912. *Lepidosaphes ulmi* (Oyster-shell Scale) is the commonest apple scale in Maine. *Chionaspis furfura* (Scurfy Scale) is said to occur in Maine, but no specimens have been seen by the Station Entomologists. It occurs in New Brunswick, Ontario, Nova Scotia and Prince Edward Island, so that its presence in Maine would not be surprising. *Chionaspis lintneri* (Lintner's Scale) has been recorded upon alder, willow, birch, dogwood and shadbush, and has been found in New York, Massachusetts, Maine, Prince Edward Island and Quebec. *Gossyparia spuria* (Elm Scale), frequently mentioned under the name of *G. ulmi*, was very abundant in the vicinity of Orono in 1912, especially during the early summer on the trunks and around the pruning wounds of the American elms. The maples in the grounds of the University of Maine were seriously attacked by

Phenacoccus acericola (Maple Phenacoccus). The distribution of the insect is wide and its host plants are said to be maple, hornbeam, lime and horse-chestnut. *Phenacoccus dearnessi* was found on gooseberry at Brunswick, Maine. Experiments not yet completed show that this insect can thrive on young apple, elm and maple grown in greenhouses. A list of 31 synonyms of *Eulecanium corni* (European Fruit Lecanium) is given from Sanders (Jl. Econ. Entom. xi., 1909, pp. 428-447). *Pulvinaria vitis*,L., was obtained from maple twigs. The number of host plants is large. The author gives a table showing the differential characters of the scale-insects in the foregoing account.

Aphidae. Miss E. M. Patch remarks that *Prociphilus venafuscus* was only found in small quantity on *Fraxinus* and these were being vigorously attacked by their natural enemies. Late in the season apterous aphides, which were believed to be of this species, were abundant upon the roots of young Balsam Firs near Orono.

Euvanessa antiopa (Yellow-edge Butterfly) was more frequently received for identification by the Station in 1912 than any other single species and was unusually abundant. *Ctenucha virginica* (Virginia Ctenucha) was also exceptionally numerous. Many of the nests of *Euproctis chrysorrhoea* (Browntail Moth) received for identification contained only or chiefly dead caterpillars. The cause of death is not clear. Some parasites were reared from a few of the nests. *Porthetria dispar* (Gipsy Moth) is reported to be making its way northward in the State and egg-masses were numerous in the autumn near Portland. The Tent Caterpillars (*Malacosoma americana* and *M. disstria*) were unusually numerous and did much damage to the foliage of apple trees in neglected orchards, both were frequently found on the same tree. Parasitic flies, *Tachina mella*, were bred from a number of the larvae of both species. *Peronia ferrugana* (Birch Leaf Roller) has been abundant in the vicinity of Orono for several seasons. The Spruce Bud Moths, *Tortrix fumiferana*, *Epinotia piceafoliana* and *Recurvaria piceaella* have been found feeding on the leaves of red and white spruce.

A Chalcid (*Monodontomerus aereus*) has been found as a parasite of the Browntail Moth in various parts of the State. This species was imported from Europe and distributed in Massachusetts about six years ago by Mr. W. F. Fiske, and since that time has gradually spread, until now it has a wide distribution in northern New England. The females hibernate in the winter webs of the moth and do not attack the caterpillars, but are parasitic upon the pupae. As a period of about two months must elapse from the time of escape of the parasites from the winter webs, until the pupation of the Browntail Moth, the parasite must live in the open during the interval. There appears to be but one generation in the year. The eggs are laid in the pupae in June, and the mature females seek shelter in the autumn in the new winter nests of the young caterpillars. The present method of destroying the Browntail Moth nests in midwinter, though effective against the caterpillars, also destroys the parasites, and some modification is necessary in order to preserve them. The

nests should be removed from the orchard or shade trees during the winter, but should be kept under normal outdoor conditions until the first warm days of spring, when both parasites and caterpillars become active. As the parasite is the first to emerge the nest could be destroyed as soon as the caterpillars are seen to be actively congregating on the outside. The nest as soon as cut from the tree may be placed in a barrel or other receptacle, the outside of which, at some distance from the top edge, should be smeared with a band of tangle-foot or some other similar preparation, so that if the caterpillars start to creep down the side they will be checked by the sticky substance. The parasite would fly off unharmed if the tangle-foot be not placed too near the upper edge. It is suggested that these barrels be placed in the vicinity of plantations in which Browntail nests are still known to exist. The parasites would thus aid in reducing the infestation in the woodlands as well as being enabled to breed and spread.

Another Chalcid, *Pteromalus egregius*, likewise imported about 6 years ago, has been gradually spreading northwards. This fly lays its eggs upon the caterpillars after they have become dormant. The developing larvae then feed externally upon the caterpillars and are fully fed before the cold weather sets in. Transformations are completed in the spring, the adults leaving the web nests two or three weeks after the caterpillars become active. This parasite should be protected in the same way as the previous one, only in this case the barrels should be left longer before destroying the webs of the Browntail caterpillars. *Pteromalus puparum* was reared in large numbers from pupae of the Yellow-edge Butterfly on several occasions during July 1912, and from one pupa alone 87 specimens emerged.

Haltica bimarginata (Alder Flea-beetle) was very abundant in many places, destroying the leaves of *Alnus incana*. *Agriotes mancus* caused much trouble to corn crops. The larvae of this insect appear to have a great capacity for resisting insecticides. Several were placed in a jar with some grains of corn which had been specially heavily coated with arsenate of lead. Several days later, some larvae were seen each half buried within the grain, the shell of which was intact except for a small hole the diameter of the insect's body. A month later only the shells remained and all the wire worms were still alive and apparently healthy. Tobacco dust, lime and other repellents also proved ineffectual. The successful growth of Canada field peas in some of the infested plots gave the suggestion that crop rotation would be the solution of the wire worm problem and experiments were made in this direction. This species, which in the middle west is known as the wheat wire worm because of its depredations upon wheat, is also a pest there of Indian corn. The adult insect probably lays her eggs near the roots of grasses and the young hatching therefrom are supposed to require three years to complete the life-cycle. Pupation takes place late in July or early in August. The adults emerge from the ground in May or June, and there is reason for believing that the pupae soon transform into adults and that they hibernate underground in this form, and not as

pupae. Complaints were received of damage by the following:—*Hylurgops* (*Hylesinus*) *opaculus* (Elm Bark Borer) *Xyleborus dispar* (Apple Tree Shot Borer), *Oberea bimaculata* (Cane Borer) and *Leptura canadensis*. *Galerucella luteola* (Imported Elm Leaf Beetle) is apparently making its way in the State of Maine. Much of the work on elms popularly laid to the door of this species in Maine during the past two seasons, however, was done by the larvae of a blue *Haltica*. *Saperda tridentata* (Elm Borer) has done considerable damage to elms in the state.

QUAYLE (H. J.). **Some Natural Enemies of Spiders and Mites.**—*Journal of Economic Entomology*, vi, no. 1, Feb. 1913, pp. 85-88.

"Red spiders" [mites of the genus *Tetranychus*] exposed as they usually are throughout their lives on the surface of the leaves and fruit, and not being very active, are subject to the attacks of a considerable number of enemies. The ones considered in this paper were observed on citrus trees in Southern California, and include, apart from several species of Acarina, representatives of six insect orders, Neuroptera, Thysanoptera, Hemiptera, Coleoptera, Diptera and Hymenoptera. Some of the least known are:—

Conventzia hageni, Bks. This Coniopterygid is one of the commonest enemies of red spider in the Southern California citrus section. It feeds on the mites both in its larval and adult stages. The eggs hatch in from 6 to 8 days, the larva completing its development in from 18 to 22 days, during which period it moults three times. All stages of the spider are attacked, including the eggs. In attacking the latter the mandibles are thrust through the egg-membrane and all the contents consumed, usually from a single puncture. The contents of spiders themselves are similarly devoured. One larva devoured 96 spiders in 16 days, another a total of 226 spiders during its development from hatching to pupation, or an average of 15 a day. When mature the larva selects a place on the under side of the leaf, usually along the mid rib, for pupation. Thirteen days are spent as a pupa, when the familiar greyish white "dusky wing" emerges.

Oligota oviformis.—This species of rove beetle (STAPHYLINIDAE) occurs on citrus trees throughout the Southern California section. The light orange-coloured egg is laid singly on the under surface of the leaf. In 7 to 9 days the larva emerges and with its sharp pointed mandibles punctures a spider about the middle of the body, the body contents being sucked out by a pump-like action. As most of the body juices of the spider are absorbed they are spewed back again and the spider, which has been made transparent by the removal of the contents, resumes its normal red colour and rigidity. This pumping back and forth is repeated two or three times. Records of the feeding of the larva show that it will consume about twenty spiders a day, or from 200 to 300 during the course of its development. The adults eat on an

average ten spiders a day, and the maximum adult life is 32 days, making a total of over 300 spiders.

Scolothrips sexmaculatus, Pergande, has been continually observed feeding on the citrus red spider and occurs most abundantly during the winter and early spring. Generally eggs and younger spiders are eaten, the spiders being mostly attacked just before the first or second moult. All stages of the thrips, except the pupa, have been observed feeding on the spiders.

Stethorus picipes, Csy. The commonest, in fact the only species of Coccinellid of any consequence found feeding on red spider. Its average duration of larval life is 20 days and during that time 189 spiders may be consumed, or an average of 6-7 per day.

Arthroenodax occidentalis, Felt.—This is a Cecidomyid fly, the larva of which has been observed to feed on *Tetranychus mytilaspidis*, *T. bimaculatus*, and *T. sexmaculatus*, being most abundant on the last species, probably because they live in definite colonies and food is thus obtained with less moving about. When the number of these Dipterous larvae is large their effect on checking the spider is considerable. One larva consumed 165 spiders in 15 days, or 11 per day, another consumed 12 per day.

Of the other known enemies of spiders, one of the brown lacewings, *Hemerobius californicus*, is very voracious and eats large numbers of spiders during its development. Records show that one of these larvae ate 532 spiders in 17 days and another 897 spiders in 20 days or an average of 44 per day.

Though each of these insects consumes many spiders the latter appear annually in large numbers.

Moore (W.). **The Maize Stalk Borer (*Sesamia fusca*, Hamp.) and its Control.**—*Agric. Jl. Union of South Africa*, v, no. 3, March 1913, pp. 419-428.

This, in the author's opinion, is the most serious pest of maize in South Africa, particularly on the high veld. It is frequently confused with the cut-worm and the maize-cob borer. The former does not bore the stem but cuts off the young plant shortly after its appearance above the surface. The cob borer is found on the cob of the maize, eating away the tender grain, and may be confused with the stalk borer as both species may be found upon the cob. The adult moth lays her eggs under the leaf sheaths in clusters of about 50 during the second and third weeks of November. These hatch in from 6 to 8 days and the larvae begin to feed immediately, and if at this time the top be pulled out of the plant and the leaves carefully unrolled as many as 25 to 100 young larvae will be found. Owing to the large number of larvae on the one plant, the food supply soon becomes limited, with the result that many of the larvae migrate during the night to other stalks; entering the new plants near the base and boring their way up through the centre of the plant, they destroy its heart and prevent any further growth. In bad years farmers frequently do not reap as much maize as they had sown. The larvae

reach full growth and pupate about the first or second week in January, the adult moth emerging in a fortnight or three weeks, when the maize plant is generally in tassel and the young ears are forming. The larvae of this second brood never succeed in doing so much damage as those of the first, though by boring into the stem of the plant they consume a large amount of valuable cattle food. Occasionally however they do considerable damage in the ear of the maize. When full grown, at the approach of winter, the larva seeks a sheltered place in the stalk, generally at the base just below the surface of the soil. Here it hibernates until late in September or early in October. The number of moths of the first brood in November depends upon the success of these hibernating larvae in passing the winter, and this is really the weakest point in their life-history. A pinch of "vaporite" placed in the funnel of each plant is claimed by the farmers in Natal to give very good results, but it is somewhat costly and in many parts the necessary labour could not be obtained sufficiently rapidly to make the treatment effective. Trapping is accomplished by planting some very early maize on which the moths will lay their eggs. This is cut by the first of December and the grubs destroyed by feeding the maize to stock. Late planting should always be adopted where possible. If planted in November the maize will not be up in time for the first brood of moths and they will either find other food-plants or die. Unfortunately this plan cannot be carried out in the colder parts of South Africa, as earlier planting is necessary in order to avoid frosts. Cutting maize for silage is a means of doing away with the stalk borer which might be more generally practised, for not only would it destroy the pest, but also the lives of valuable cattle might thus be saved in case of drought. The maize is cut for silage before the stalk borers have sought their winter quarters and they are thus destroyed. Another method used by some farmers with success is to harvest the ears, pasture the field, and then pull out all stalks that are not eaten and burn them. Unfortunately the labour required for removing the stalks is often more than the farmer can afford and they are left in the ground, in which case he is adopting one of the best methods for breeding the moths.

Large numbers of larvae have been found dead, black and dried up, in frost-bitten stubbles late in June. It was first thought that some bacterial disease was at work, but this was proved not to be the case, and from experiments that have been made it was concluded that the larvae had been killed by cold. Some larvae were found to have been destroyed by a Braconid parasite, *Stenopleura sesamiae*, and also by a small species of predaceous ant, *Dorylus helvolus*. Figures are given showing the number of larvae alive, those killed by cold, those destroyed by the parasite and those destroyed by the ant, under different treatment and at different periods. The maximum destruction done by the Braconid was found in stubbles examined on 11th October and the same field also showed the highest average of destruction by ants. The largest number of larvae killed by cold was found in stubbles examined on 8th October,

and the author has no doubt that the practice of exposing the stalk to cold and the action of parasites are valuable means of diminishing the pest.

Further observations were made on the effect of winter ploughing, and it was found that on the 30th December no moths had appeared, although they should have at least been out by the 30th November. When the plot was dug up in January, the stalks had all rotted and a few remains of empty pupal cases were found, but no other evidence of the presence of the stalk borer.

The author thinks that the result of these experiments goes to show that winter ploughing is a means of controlling the pest.

Lounsbury (C. P.). **Caterpillar Wilt Disease.**—*Agric. Jl. Union of South Africa*, v, no. 3, March 1913, pp. 448-452.

During December last attention was called to an insect disease, to which the names "caterpillar wilt" and "insect cholera" had been applied, which caused a great mortality amongst caterpillars of various species, and it is possible that in a normal season it prevents the wattle bagworm (*Chaulioides junodi*) from becoming seriously abundant and accounts for this pest being less prevalent in rainy than in dry seasons. The symptoms are as follows:—The caterpillar becomes inactive, ceases to feed and voids much dark-coloured fetid liquid matter. The posterior part becomes distended and caterpillars which are normally smooth and green present a lustreless and sickly appearance. The victim turns dark, becomes flaccid and the body contents, beginning from the posterior end, break up into a black liquid with offensive odour. When attacked, the caterpillar usually seeks an elevated position such as the top of an herbaceous plant, and at death remains clinging to its support by its anal or one or more of its abdominal prolegs, and in a few days only a dry and blackened skin remains. A disease of this general character has been ascribed by different writers in Europe and America to various organisms, but the author thinks there is much reason to question whether there is one principal disease or a number of diseases of different origin which produce somewhat similar effects on the victim. Whatever its nature may be, he is of opinion that the type which occurs in South Africa is unlikely to be excelled in virulence. In the lucerne fields it is not an uncommon sight to see almost every stem crowned by a dead or dying larva of *Colias electra* or of *Heliothis obtectus*, two very common and destructive pests of lucerne. Attempts made to propagate the disease in Europe and America by feeding caterpillars on leaves which had been soaked in water, are referred to at length and were repeated by the author on the above-mentioned lucerne caterpillars and with the pepper tree caterpillars (*Bombicomorpha bifascia*), which are common in the Transvaal, and in all cases the disease manifested itself.

Several instances are given of the destruction of caterpillars following the introduction of the virus into fields of lucerne, but the author has very little doubt that the success of at least one

of these experiments was much more apparent than real and that the disease probably existed already amongst the caterpillars. Apparently the fact that the disease can be induced in caterpillars by feeding them on wet leaves has been known for some time. A writer in one of the local newspapers stated that an excellent method of getting rid of them in a garden was to collect a few, feed them for a time on wet lettuce, and turn them loose, and the author thinks that after all this may be a simple and thoroughly effective method of dealing with the pest.

Cimatti (V.). **Contro la Diaspis del Gelso.** [Control of *Diaspis* on Mulberry.]—*Rivista di Agricoltura, Parma,* xix, 21st March 1913, p. 187.

The author considers that insecticides are of no use against this pest, but if the trees have been well pruned in autumn and well brushed in winter, the next thing to be done is to disseminate the Chalcidid parasite, *Prospaltella*, over the mulberries. The material can be obtained from the Travelling Agricultural Schools or from the Royal Entomological Station at Florence. If the infection be properly spread he says that the orchard owners need have no care until the following autumn. The next autumn and winter they will be able to determine how far the pest has been destroyed. He suggests the following scheme of operations for those persons who have made use of *Prospaltella* in the past year. In the month of March several branches of the trees which have been well infected with the parasite should be cut and attached to trees which are attacked by the *Diaspis;* these trees will serve during the present year for the further spread of the *Prospaltella*. In the colder parts of Italy, *e.g.*, Piedmont, the results obtained from the Chalcidid are more perceptible in the second year of infection. All growers who have already made use of *Prospaltella* should endeavour to spread it as much as possible, and the author assures them that in a few years they may feel quite certain that the *Diaspis* will have totally disappeared.

Scelsi (S.). **La Diaspis Pentagona.**—*Rivista di Agricoltura*, xix, *Parma,* 17th January 1913, p. 42.

The author gives a popular description of the insect and the damage done by it, and says that it is more easily controlled in winter than in summer. If the *Diaspis* can be detached from the branch and made to fall upon the ground it dies, and he strongly recommends the use of steel gloves known as "Sabate or Targioni gloves" or wire brushes. Even this method does not succeed completely, because large numbers of *Diaspis* remain attached in crevices of the bark and thus escape the brush. All that remain are capable of laying eggs in the spring, and this must be either prevented or the eggs destroyed, which can only be done by injecting some insecticidal fluid with a pump into all such cracks and crevices. He gives the following formula:—Carbonate of soda, 450 grams; heavy oil of tar, 900 grams; water.

10 litres; to be thoroughly emulsified by frequent passage through the pump. The difficulty of maintaining the mixture has led to the use of a special liquid known as Professor Perroncita's Diaspicide, a one per cent. solution of which is said to answer every purpose.

Cockerell (T. D. A.). **Two new Coccidae.**—*Journal of Economic Entomology*, vi, no. 1, Feb. 1913, pp. 142-3.

A new Coccid, *Drosicha lichenoides*, from the Philippine Islands. lives on the bark of *Ficus nota*, frequenting only areas covered with patches of whitish lichen, the colour of which it imitates so closely as to be almost hidden. It is commonly attended by an ant, *Dolichoderus bituberculatus*, Mayr, which led to its discovery.

On a species of *Agropyron* at Glenwood Springs, Colorado, a mealy bug, *Trionymus violascens*, sp. n., was found in considerable quantity.

Burgess (Q. F.) & Rogers (D. M.). **Results of experiments in controlling the Gipsy Moth by removing its favourite food-plants.** —*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 75-79.

For many years great efforts have been made to perfect mechanical methods for controlling the gipsy moth. In the earlier observations on this moth in New England the conclusion reached was that the larvae were general feeders and that practically all the trees or plants would suffer severe injury on account of being defoliated by them. In 1904-1906 large woodland areas were quite defoliated by these caterpillars in the Boston district. In 1907 it was noticed in many places that, where the gipsy moth defoliation had been severe, the larvae seemed to show some preference in the species of trees attacked. Thus white and pitch pine were not severely defoliated unless they were growing in or near an area of hardwood trees.

Observations showed that the gipsy moth caterpillars will eat almost any kind of vegetation, although they prefer the foliage of oaks, willows and apple trees. The ash, juniper and red cedar are practically immune from attack and maple is not injured to any great extent if more desirable food is within easy reach. Owners of woodlands are advised to cut timber of marketable size if the gipsy moth is prevalent in the region. The poor and worthless trees should be cut, leaving for reforesting purposes vigorous specimens of ash, maple, pine, or coniferous trees of which the insect is not specially fond. The planting and preservation of ash and hickory is recommended, as the wood is of high value and the trees are not subject to the attacks of brown-tail moth.

Details are given of various experiments in which forest areas were cleared of susceptible trees, only resistant species, such as chestnuts, pines, maples, etc., being left standing; in every case such thinning resulted in a very marked diminution of gipsy

moth attack. Some years must elapse before accurate data are to hand with regard to this question, in order to obtain complete information on the feeding habits of gipsy moth caterpillars in each stage and on all food-plants which are common in New England; present results, however, indicate that the oaks should be eliminated as rapidly as possible, and also grey birch, wild apple and willow.

Cameron (A. E.). **A Note on Two Species of Bassid Ichneumonidae Parasitic on a Species of Syrphid Larva.**—*Entomologist*, xlvi, April 1913, pp. 130-131.

The author has bred a small species of Ichneumon, *Homocidus dimidiatus*, from pupae of a Syrphid fly, *Platycheirus albimanus*. Both the Syrphid and its parasite are on the wing as adults from May to September. The Syrphid hibernates in the larval stage, pupates in March, and the adults emerge in the beginning of May. Another Ichneumon, *Homocidus tarsatorius*, was reared from the same host.

Watson (J. R.). **New Thysanoptera from Florida.**—*Entom. News, Philadelphia*, xxiv, no. 4, April 1913, pp. 145-148.

Seedlings of camphor (*Cinnamon camphor*) at Satsuma, Fla., suffered much damage from *Cryptothrips floridensis*, sp. n. Feeding on a fungus under orange tree bark, *Phloeothrips floridensis*, sp. n., occurred in the greenhouse of the Florida Experiment Station at Gainesville. On orange leaves were discovered numerous thrips closely resembling *Leptothrips asperus*, but differing in having large posterior ocelli and strong thoracic spines. For these the author proposes a new subspecific name, *macro-ocellatus*.

Kleine (R.). **Lebenszähigkeit von Schmetterlingsraupen.** [Vitality of a lepidopterous caterpillar.]—*Zeits. Wiss. Insektenbiol.*, ix, 2, 15th Feb. 1913, pp. 59-60.

A caterpillar belonging to the genus *Agrotis*, included for a fortnight in the ice covering a pond in November, was thawed out, began to move its mouthparts after half an hour and attacked a cabbage-leaf soon after. The following day it apparently had entirely recovered.

Schuster (W.). **Der Pfirsichbock, *Purpuricenus koehleri*, Fabr., im Mainzer Becken.** [The Peach Longicorn, *Purpuricenus koehleri*, in the Mainz Basin.]—*Zeits. Wiss. Insektenbiol.*, ix, 2, 15th Feb. 1913, p. 60.

In June this peach borer, otherwise a Mediterranean and South Russian species, may frequently be met with on diseased peach trees in the warm fruit district near Mainz.

Green (E. E.). **Remarks on Coccidae collected by Mr. Edward Jacobson, of Samarang, Java, with descriptions of two new species.**—*Tijds. Entomologie*, lv, pt. 4, 24th Feb. 1913, pp. 311-318, 2 pls.

The collection consists of only eight species, two of which are new, and all of biological interest. *Dactylopius* (*Pseudococcus*) *citri* is universally distributed and associated with an Aleurodid and ants (*Oecophylla smaragdina*) on *Loranthus*. *D.* (*Pseudococcus*) *maritimus* was found on the sea-shore of Krakatau and has been previously recorded only from California. Protected by its waterproof mealy secretion it may have been carried to the Malay Archipelago in the crevices of driftwood by the equatorial current. A more probable explanation may be the direct importation on living plants from California, and subsequent accidental distribution from Buitenzorg. The cosmopolitan species *Lecanium* (*Saissetia*) *hemisphaericum* was found, attended by the ant *Oecophylla smaragdina* on *Loranthus* and *Flacourtia*. *L. discrepans*, previously only known as a Singhalese species, was found associated with the same species of ant, at Semarang; as was the new *Lecanium opimum*. The ants construct protecting webs over the assemblage of Coccidae. In spite of this protection, the insects are parasitised by a Braconid, and are attacked by the carnivorous caterpillar of a moth (*Eublemma* sp.). *Eublemma* also attacks *Tachardia aurantiaca*, found at Semarang on *Flacourtia*. The second new Coccid is *Icerya jacobsoni*, occurring at Semarang on *Dombeya acutangula* and infested with larvae and adults of a small Coccinellid beetle.

Schulze (P.). *Scolytus geoffroyi*, Goeze (Col., Ipid.) an Wallnuss. [*Scolytus geoffroyi*, Goeze, on the Walnut.]—*Zeits. Wiss. Insektenbiol.*, ix, 2, 15th Feb. 1913, p. 59.

In a decrepit walnut tree felled in the garden of the Berlin Royal Mining Academy the burrows of a beetle were discovered which seem identical with those caused by *Scolytus geoffroyi*, usually considered to live exclusively on elms, and very rarely on ash and birch.

Courtet (H.). **Nos Colonies à Bovides.** [Our cattle-rearing Colonies.]—*Bull. Soc. Nat. d'Acclimatation*, 1st Feb. 1913, pp. 73-76.

The author says that the pasturage for cattle in New Caledonia is not of the best quality. Great carelessness appears to have been shown in the past as to the choice of pasture herbage and no care whatever has been taken to provide forage plants from without, possibly because the locusts consumed everything. These insects have caused great damage in New Caledonia, not only to pastures but to other forms of cultivation, and the administration has awakened to the fact that something must be done to meet the pest. M. Escande, a cattle breeder, in 1896 made a formal

report on the subject of locusts, describing their habits and life-history in New Caledonia at length.

Considerable sums have been spent uselessly through not paying attention to the important consideration that locust hunting is only profitable from 12 to 15 days after the hatching which follows the cold season, that is to say from September to November. The General Council voted 20,000 francs for locust destruction on these lines, but in consequence of want of co-operation the results were not such as might have been expected. Some years later with better organisation, better results were obtained. Attempts were made to use the locust fungus from the Bacteriological Laboratory of Grahamstown, but with no success.

Severin (H. H. P.). **Precautions taken and the danger of introducing the Mediterranean Fruit Fly (*Ceratitis capitata*, Wied.) into the United States.**—*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 68-73.

The author refers to the lack of precautions taken at ports along the coasts of California, Oregon and Washington against the importation of fruit from Honolulu. All fruits and vegetables bought in Honolulu for ships' stores are to be thrown overboard before the three-mile limit is reached, but this is a questionable precaution, for it has been shown that Mediterranean fruit fly maggots can develop into adult flies after immersion in sea water for 45 hours. *Ceratitis capitata* may be introduced into the United States from the Hawaiian Islands in pineapples and bananas, also in the wrappings. The latter are supposed to be burned on arrival, whilst all fresh pineapples for Californian ports are fumigated before they leave the dock. The author surmises that the chief danger of introducing the fly rests with travellers making a trip to the Hawaiian Islands who carry Hawaiian-grown fruit in their trunks into California.

Newell (W.). **Notes on the Rice Water Weevil (*Lissorhoptrus simplex*, Say), and its Control.**—*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 55-61.

Lissorhoptrus simplex is generally distributed and generally destructive, over the entire rice-growing belt of the Southern United States.

Cultivated rice is preferred as host and food-plant, and little difference is noted in choice between the Honduras and Japanese varieties. The adults prefer to feed on young plants. Infestation of the rice field by the adults is invariably co-incident with the first flooding. Howard mentions wild rice, bulrush, water lily and spatter dock as food-plants of the adults. In all rice fields where rice and *Paspalum membranaceum*, Walt., were interspersed, the adult weevils fed freely upon the leaves of both plants. They also fed upon another unidentified *Paspalum* which was found to have its roots heavily infested with the larvae.

This *Paspalum* is about the first grass to begin growth in the spring, occupying drainage ditches, shallow ponds and all places where shallow water is available.

The adults fly readily to artificial lights of all kinds, especially upon dark, warm nights. It therefore seems not improbable that lamp-trapping just before or during oviposition would possess value as a remedial measure.

The larvae, known to planters as "rice maggots," eat off the small, tender roots and rootlets, and injure the larger older roots by gnawing into them. As many as 4-8 larvae (or sometimes 10-12) may be found on the roots of one plant, and this will then present a yellowish, sickly appearance with some of the lower leaves discoloured and dead. From 35 to 45 days elapse from the deposition of the egg until completion of the larval stage. The duration of the pupal stage is unknown.

The only control measure used during the last thirty years has consisted in drawing off the irrigating water, with a view to destroying the larvae, a measure that is not always successful. As the adults feed upon the rice leaves before and during oviposition, it is suggested that they might be destroyed by the use of arsenical sprays, or by dusting the plants with powdered arsenate of lead.

Dean (Geo. A.). **Further data on heat as a means of controlling mill insects.**—*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 40-55.

If a mill be infested with the "confused flour beetle" (*Tribolium confusum*) and the other little rust red flour beetles, the "cadelle" (*Tenebrioides mauritanicus*) and the saw-toothed grain beetle (*Silvanus surinamensis*), the ordinary fumigation method of treatment is of little value, for these insects are found in cracks and in accumulations of flour inaccessible to any gas. The confused flour beetle and the cadelle are found in practically every flour mill in America, Southern Canada and Europe, and in their larval stages do an immense amount of damage.

During the summer of 1910, a 1,000 barrel frame mill in Topeka was given a thorough fumigation with hydrocyanic acid gas; yet a few months later the mill showed evidence of serious insect infestation. The following spring a second fumigation was given with the same gas; one month later insects were again causing trouble. During June, without any change or additional radiation in the heating system of the mill, the heat was turned on one Sunday morning and continued until nearly Sunday midnight. Examination showed that far more insects were killed than in the gas fumigations and a further examination several months later failed to reveal a single live Mediterranean flour moth at any stage. In another mill, during the summer of 1910, fumigation with hydrocyanic acid gas was tried and before the summer was over not only were the common mill insects becoming abundant, but the Mediterranean flour moth was doing serious injury. The following summer the mill was heated from one

Sunday morning to midnight and next day no insect escaped death on the floors where the heat ranged from 115° to 130° F. An examination a year later showed that the Mediterranean flour moth was completely eradicated.

Many mill insects do not yield readily to hydrocyanic acid gas, but no mill insect can withstand for any length of time a temperature of from 118° to 122° F. Experiments showed that the leather beetle (*Dermestes vulpinus*, F.) was killed by a temperature of 125° F. without injury to the books it was infesting.

PARROTT (P. T.). **New destructive insects in New York.**—*Jl. Econ. Entom.*, vi, no. 1, Feb. 1913, pp. 61-68.

During 1912 the losses sustained by the depredations of insects were very large. In variety of species and extent of damage the record has not been equalled for many years, whilst a number of comparatively new insects came to the front.

The Pear Thrips (*Euthrips pyri*), attacks all of the important tree fruits, but seems to be specially injurious to pears of the varieties Kieffer, Seckel and Clapp Favourite. During the spring of 1912 the blighting of blossom clusters in some orchards was very severe and caused a great reduction in fruit yields. Apple trees, though visited by large numbers of the adults, suffered to a much less extent. The stems of sweet cherries were specially attractive to the adults for the deposition of eggs. Spraying is the most promising means of affording protection to orchards.

The Cherry Sawfly Leaf-miner has done considerable damage. The pest attacks sour cherries, preferring the Morella variety. The larvae eat the interior of the leaf, leaving the epidermis, which turns brown and forms a large conspicuous blister. Often the whole leaf is mined, but usually from one-quarter to one-half is destroyed. The principal damage occurs during the last week of May and the early part of June, or about one month before the harvesting of the fruit. The extent of damage varies with the season and if new growth is not abundant the loss of leaves can hardly fail to affect the yield to an important degree. The sawfly proves to be a new species and is referable to a new genus. It has been described by Dr. A. D. MacGillivray as *Profenusa collaris*.

Polydrosus impressifrons, Gyll., has become extremely abundant. These weevils have been observed on the young leaves of poplars and willows, and also on the foliage of roses, apples and pears. During 1912 their destructive capacity was noticed on a large block of grafted willows (*Salix caprea*), serious injury being caused by the beetles feeding on the young buds of the grafts. Little information has been obtained regarding this species, as it has attracted no special attention in Europe. Schilsky says it is quite common in Germany, and Zimmerman says that in Austria the beetles are not numerous enough to be destructive. Giard intimates that it is a common but not an important insect in Europe, but this does not warrant the conclusion that it will prove of no importance in America.

Apple and Cherry Ermine Moths. *Yponomeuta* caterpillars were introduced into the United States in shipments of foreign nursery stock. Special precautions have been taken against them and infested plants have been detected in thirteen localities in New York State. Over nine hundred colonies of caterpillars have been collected; from some of this material two species of moths have been bred *Yponomeuta malinellus*, Zell., which thrives largely on apple, and *Y. padellus*, L., which is a more general feeder, showing preference for hawthorn, plum and cherry. Both species are common and destructive fruit pests in Europe.

The False Tarnished Plant-bug has caused serious losses of pears. [*See* p. 126 of this Review.] It also seeks grape blossoms and punctures the stems as well as the pedicels of the blossoms and fruits, causing imperfect clusters of grapes.

In recent years the work of various Capsids on apple and pear fruits has been increasingly conspicuous. In addition to *Lygus invitus*, the nymphs of *Campylomma verbasci*, Meyer, and *Paracalocoris colon*, Say, have been observed puncturing young pears soon after the dropping of the blossom. The red bugs (*Heterocordylus malinus*, Reut., and *Lygidea mendax*, Reut.) are doing considerable damage by destroying young apples, or causing the fruit to be deformed so that it is unmarketable.

Last in the list of new destructive insects of New York and more important than all is the Gipsy Moth (*Porthetria dispar*, L.). The pest is largely confined to a few old apple trees in the rear of several residences. According to G. G. Atwood, the presence of this species in the residential section of New York appears to be due to importations of nursery stock which was unpacked in the immediate vicinity of the fruit trees; the infestation was probably started by not more than one mass of eggs, and is not more than three years old.

Jones (C. R.). **Maize Pests in the Philippines.**—*Philippine Agric. Review*, part 1, no. 3, March 1913, pp. 115-117, 1 fig.

The larvae of three species of Noctuids have thus far been found injurious to maize in the Philippines. Severe outbreaks are exceptional and only occur in abnormal seasons; more or less damage is however done from year to year by these worms, and in many cases the cornstalks are eaten down to the ground, necessitating replanting. The Visayan Islands were infested throughout in 1912, and the pest may be common in other parts of the Archipelago, although no reports to this effect have been received by the Bureau of Agriculture.

The three species referred to are, *Prodenia litura*, F., and *Sphodoptera mauritia*, Boisd., which eat the leaves, and *Chloridea obsoleta*, Hübn., known as the bud-worm, from the habits of the larva. The extent of damage is exceedingly variable; the leaves may be stripped only here and there or whole fields may be entirely destroyed. Large plants resist better than smaller ones, new leaves being more quickly formed, but this defoliation retards the growth of the stalks, and is thus detrimental to the production of grain.

The best method of control is by the use of arsenical poisons and of these arsenate of lead and Paris green give the best results. They may be applied in either the dry or liquid state. The dry method is more simple, and arsenate of lead is preferable to Paris green, the latter, if applied in excess, having a tendency to burn the plants, whereas they may be covered with the former without fear of injury. Either poison should be mixed with 4 or 5 times its weight of flour or air-slacked lime; this will reduce the cost of application without diminishing the effect. The operator carries two cloth bags at either end of a bamboo, so arranged that as he walks between the rows, each bag hangs over a row; as he reaches a plant he jars the bamboo, and in this way sufficient powder is shaken out. Poisoned bait has also been used with success, the preparation recommended being 50 lb. of rice bran to 1 lb. of Paris green, with the addition of some burnt sugar and water. This mixture is dropped in balls on the ground around the plants. As the caterpillars are general feeders and are found extensively upon grass around the edges of the fields, it is a good plan to apply the poisons to these places, but this grass must not be used as food for animals.

Jones (C. R.). **The Mango Bark Borer.**—*Philippine Agric. Review*, part 1, no. 3, March 1913, pp. 118-124, 3 pls., 1 fig.; Circular No. 20 of the Bureau of Agriculture.

The author's attention was called in October 1912 to a very serious insect attack upon the mangos in the suburbs of Manila, many trees having been killed from this cause. The insect was identified as *Plocaederus ruficornis*, Newm., a comparatively large Cerambycid beetle, and it has subsequently been discovered that the pest is not confined to Manila, but has been reported from Baliuag, Bulacan; Pontevedra, Occidental Negros; San Pablo, Laguna; and Lamao, Bataan.

Although the author does not think it desirable to arouse unnecessary alarm as to this pest, he nevertheless regards it as the most serious menace to the mango industry at present in the Philippines, and precautions should be taken to keep it under control.

Observations near Manila show that the beetle prefers the larger trees and in fact no tree of less than 10 years of age was found to be infested. The trunk and underside of the larger branches are the points usually attacked and it is not until the tree has become severely weakened that the tops of the limbs are invaded. The first attack is frequently made at the base of the trunk, the larvae working their way slowly upwards and each successive brood beginning their attack higher up the trunk or out on the larger branches.

The author says that the deplorable custom of slashing the bark of the mango trunk in order to force the tree into fruit, is in part to blame for the injury, since the older bark curling up slightly at the margin of these "bolo," or cutlass, scars forms a very attractive place for the female to deposit her eggs. Trees

generally recover from the first attack, since the bark is of sufficient thickness to allow the larvae to feed in it without seriously damaging the cambium layer and the young sapwood just beneath; when other attacks follow, however, the tree is frequently so weakened that its death results.

Control was first thought to be hopeless, but a careful study of the insect and the behaviour of the tree under treatment indicate that the methods recommended will suffice to check, if not to eradicate the pest. A large number of larvae are required to cause sufficient damage to produce the death of a large and vigorous mango tree, so that the reduction of the number of these beetles below the killing point in any outbreak will render future damage comparatively slight, and concerted action should practically eradicate the pest; but if it is allowed to continue uncontrolled, one of the most important fruit trees of the Archipelago may be practically wiped out.

The life-history of the insect is briefly as follows:—The eggs are deposited singly on the bark of, or inserted into crevices or wounds in, the base and lower part of the trunk. The young larva burrows its way into the inner bark and in the soft tissue between the sapwood and the bark the entire larval stage is passed. As there is no frass the presence of the larva is not easily detected from the outside, but by careful tapping an acute ear will detect the hollow sound which indicates its burrows, some of which may be 40 centimetres long by 20 centimetres wide. The larva, pupa and perfect insect are briefly described and figured. The full grown larva is 5 to 6 centimetres in length and when ready to pupate forms a calcareous cocoon in the frass under the bark. The adult insect is rather a conspicuous beetle 23 to 45 mm. in length, the female being fully twice the size of the male. The Tagalog name for this beetle is "Barbero."

The only feasible method of control is to extract the insects from the trees, and the apparatus required is a ladder, a rope, and a spray pump, and a cutlass or some other tool for removing the bark over the infested areas. The labourer simply cuts or pulls off the bark and removes all the frass, grubs and pupal cases. A triangular-bladed hoe fastened to the end of a bamboo pole may be used with great advantage on the branches and upper part of the trunk. When the burrows have been cleaned out and the frass and decaying bark entirely removed the area should be sprayed with a resin wash to prevent the entrance of fungi and wood-boring insects. Observations made by the author show that trees treated in October and kept under close observation have recovered completely, new bark growing over the exposed areas, and some trees which had been practically girdled by the insects recovered, flowered and bore fruit.

The mere exposure of either the larva in its burrow or the pupa after removal from its cell was found to be fatal, and for this reason rearing experiments in the laboratory were rendered exceedingly difficult; but as a few live insects may be left in the material removed by the labourers, the burning of this is strongly recommended.

Jones (C. R.). **The Mango Fruit Fly and other pests in the Philippines.**—*Philippine Agric. Review*, part 1, no. 3, March 1913, pp. 141-142.

The author calls attention to the fact that some months ago fruit of *Eugenia malaccensis*, L. (the Malay Rose Apple) obtained in the market was found to be infested by the Mango Fruit Fly (*Dacus ferrugineus*, F.). These flies are common throughout India, Ceylon, Java and Amboina, as well as the Philippines, and do considerable damage to fruit, particularly to mango and citrus fruits. Over 50 species of the genus *Dacus* have so far been described from Malaysia. In many gardens throughout Manila considerable damage has been done to tomatoes by a Coccinellid, *Epilachna vigintioctopunctata*, F. This pest feeds, in both the adult and larval stages, on the upper and lower epidermis of the leaf. Observations made on two females which emerged on 6th February show that from 6th March to 15th May these two insects laid 960 eggs in 40 clusters. Paris green or arsenate of lead affords sufficient control. Great damage has been done to young maize by the Maize Stalk-Borer (*Pyrausta vastatrix*, Schultze). This Pyralid bores the stalk at the joints, in which it spends both the larval and pupal stages. The only method of control is by trapping, by destroying infested stalks or by parasites. So far this pest has only been reported from Luzon.

Rust (E. W.). **New Peruvian Parasites from *Hemichionaspis minor*.**—*Entom. News, Philadelphia*, xxiv, no. 4, April 1913, pp. 160-165.

The tree-cotton (*Gossypium peruvianum*) in the Department of Puira, N.W. Peru, is infested by a scale-insect, *Hemichionaspis minor*, the local name for this pest being "piojo blanco." The latter has numerous enemies, especially among the Aphelininae and Signophorinae. The new species *Prospaltella peruviana* is a very common parasite of *H. minor*, and *Signophora lutea*, sp. n., was also found on *Pseudaonidia* infesting cotton and citrus. *Neosignophora nigra* (gen. n., sp. n.) has been reared by Prof. C. H. T. Townsend from *H. minor* on cotton from Chaquira.

Hardy (J. R.). **Notes on *Melanotus castanipes*, Payk.**—*Lancs. Naturalist*, v, no. 59 (N.S. no. 47), Feb. 1913, pp. 415-416.

In Delamere Forest, Cheshire, in December 1912, the author captured a female of the Elaterid beetle, *Melanotus castanipes*, at the end of a burrow of *Rhagium bifasciatum* larvae, infesting a log of *Pinus sylvestris*. Several specimens of *Ichneumon confusorius* and *I. albiger* were also found in the burrows of the Longicorn, probably using them as a hybernaculum.

Green (E. Ernest). **Further observations on the genus *Margarodes*.**—*Records of the Indian Museum*, ix, pt. 1, Feb. 1913, pp. 1-9, 4 pls.

Margarodes papillosus, Green. It is probable that the males pass through a nymphal encysted stage similar to that of the females, though they are at present unidentified. Specimens were obtained from Honnali, Shimoga District, Mysore, and from the Bellary District. In the former locality they were found while digging for egg-pods of the Tola Grasshopper in a broad "bund." They were fairly numerous and were obtained from 5 to 7 inches beneath the soil, being associated with "hariali" grass (*Cynodon dactylon*). This form was found on all soils, black and red, but seems to be more abundant in clayey soils. The adult males and females emerged early in June.

Margarodes niger, Green. The male is unknown; the nymphs undergo several stages, their exact number is uncertain, but the final stage is in the form of a globular cyst of an opaque black colour. The specimens of *M. niger* were obtained from the same localities as *M. papillosus*. In both instances they were found at the roots of *Cynodon dactylon* and the early stages of the insect were found to be actually attached to the rhizomes of this grass. They were also found at the roots of red gram. The peculiar globular egg-like bodies were met with at a depth varying from $\frac{1}{2}$ to 3 inches in the soil, mostly in red soils. Towards the end of February and in March some of these bodies hatched into stout, soft, hairy, grub-like creatures, which were the adult females.

Holman Hunt (C. B.). **Note on Insect Pests.**—*Agric. Bull. Fed. Malay States*, i, no. 8, March 1913, pp. 294-295.

An undetermined butterfly larva is very prevalent in the coconut plantations of Perak, being found near Kuala Kangsar and Parit Buntar. The caterpillars are 2 or more inches in length, of a greenish colour, with a purple band running along the sides and crossing the hind end of the abdomen. They spin the sides of one blade of a coconut leaf together, forming a tube, in which one or more may live and from which they emerge to strip the blades in the neighbourhood of the mid-rib. The larva is full fed in March, and is liable to fungus and Ichneumon parasites. A suggested means of dealing with the pest is to collect and keep the larvae in order to breed and release any parasites they may contain, while the butterflies that emerge could be destroyed.

A somewhat similar pest is attacking plantains in various districts. In this case the larvae roll up pieces of the plantain leaf like a huge cigar. Similar treatment is advised for the eradication of this pest.

In Krian a Psychid moth is causing much damage to coconut leaves; while a Hispid beetle is also damaging the coconuts in Singapore. The beetle is difficult to eradicate: it lies in the axils

of the leaves and in both stages eats holes in the leaves. Collecting affected leaves and burning them would be the best preventive. *Brachartona catoxantha* has done considerable damage near Batu Gajal, but the native owners of holdings refused to allow steps to be taken to check the pest.

Allen (W. J.). **Prune Growing.**—*Agric. Gaz. of N.S. Wales*, xxiv, pt. 3, March 1913, pp. 245-255.

The following instructions are given for dealing with the insect pests of prunes. For San José Scale, red oil, lime and sulphur, and fumigation are recommended. Spraying should be as late as possible before the buds burst in the spring. For Curculio, the trees should be sprayed with arsenate of lead just as the buds are opening and again when the petals have fallen. The fact that the beetles feed upon the foliage of blooming trees just about the time when the fruit is forming, makes the spraying method effective. Up to the present the pest has not been troublesome. Trees should be carefully watched for the castings of borers. Regularly remove and burn or boil any infected and fallen fruit, to eradicate fruit fly. For red mites use lime and sulphur and red oil as late as possible before the buds burst in the spring. For aphis, spray as soon as observed and as often as necessary; tobacco wash, Sunlight soap and red oil emulsion are advised.

Kleine (R.). **Die Kümmelmotte, *Schistodepressaria nervosa*, Hw. Ein Beitrag zu ihrer Biologie und ihrer Bedeutung für die Landwirtschaft.** [The Caraway Moth, *Schistodepressaria nervosa*. A contribution to its biology and agricultural significance.] —*Zeits. Wiss. Insektenbiol.*, ix, 2, 15th Feb. 1913, pp. 37-41; ix, 3, 15th March 1913, pp. 69-72, figs. 1-7.

Comparatively few insect pests cause any serious harm to the caraway plant. The moth, *Schistodepressaria nervosa*, however, is responsible for immense devastations, so that a knowledge of its life-history is of great importance. It is not easy to detect, partly on account of its coloration, and partly owing to its habit of hiding in dark places.

As a result of his observations the author concludes that *S. nervosa* pairs in autumn, the males dying soon after, while the females hibernate until the following March. The date of oviposition (usually March till May) depends on the temperature, so that both pupae and females that have not yet oviposited may be found at the same time. The supposition that the females oviposited on leaves led to the practice of letting sheep graze off the outer leaves or stems. This has been tried on a large scale, but without success. The reason is elucidated by the author's observations, which showed that the eggs are never laid on the leaf, and only occasionally on the distal end of the leaf stalk, but generally in the convex inner part of the latter near the axis, being usually found in pairs, and rarely in threes or singly.

Davidson (J.). **The Structure and Biology of *Schizoneura lanigera*, Hausmann, or Woolly Aphis of the Apple Tree. Pt. i.**—*Quarterly Jl. Microscopical Science*, lviii, pt. 4, 1913, pp. 653-701, pl. 38-42, text-figs. A-D.

The author, after reviewing the present state of knowledge regarding the infection of the apple trees by aphids and the life-history of *S. lanigera*, describes the structure of the apterous viviparous female. This description forms the first part of the paper to which is added a fairly extensive bibliography. The damage to the infected trees is caused by the galls (which may possibly be formed by a special ferment occurring in the salivary glands of gall-producing species) hardening and cracking and so allowing the entrance of spores of *Nectria ditissima*, the canker fungus. The 'mother queen' of *S. lanigera*, differing from the apterous viviparous female in being stouter and of a shorter contour, lives in the crevices of the bark of apple trees and produces a colony of 'lice.' These become imbedded in their waxy secretion, moult, and in two or three weeks become apterous viviparous females. Towards the end of summer some of them develop into nymphs, which in their turn develop into winged viviparous females. The latter seek other apple trees and produce new colonies of lice. Late in the autumn sexual males and females may be produced, but this is rare. The oviparous female of this true sex generation lays a single egg and dies. The winter eggs remain in the cracks of the bark during the winter and hatch out in the following spring, and the resulting larvae develop into mother queens.

Tower (D. G.). **A New Hymenopterous Parasite on *Aspidiotus perniciosus*, Comst.**—*Ann. Entom. Soc. America*, vi, no. 1, March 1913, pp. 125-126.

The parasites were reared during October 1912 from *Aspidiotus perniciosus* at Amherst, Mass., specimens being sent to Dr. L. O. Howard, who regarded them as a new species, *Prospaltella perniciosi*.

Manee (A. H.). **Observations on Buprestidae at Southern Pines, North Carolina.**—*Entom. News, Philadelphia*, xxiv, no. 4, April 1913, pp. 167-171.

Occasional specimens of *Chalcophora virginiensis* were found on young pines in October. During the first quarter of the year they live under pine straw, mostly on the north side of old trees, while they were common, together with eggs, on freshly dead pines in April and May. *C. georgiana* is more abundant than the last species and feeds on young pine needles.

Dicerca punctulata was found under pine straw or in the bark of loblolly and long leaf pines. *Buprestis apricans* oviposits exclusively in cracks of dry dead spots or blazes of large *living* long leaf

pines. A new species, *Melanophila carolina*, Blanchard MS., was discovered on needles of young long leaf pines. Other species destructive to pines are *Anthaxia flavimana*, *Chrysobothris floricola*, *C. dentipes* and *C. pusilla*. Of the oak Buprestids, *Brachys ovata* is the most abundant, living and pupating on the leaf; others are *B. aerosa*, *Anthaxia quercata* and *Taphrocerus gracilis*. On persimmon were found *Dicerca obscura*, and *Chrysobothris chrysoela*; on the black alder, *Dicerca pugionata*, *Eupristocerus cogitans* and *Agrilus granulatus*; on willow, *A. politus*; and on blackberry, *A. ruficollis* and *Acmaeodera culta*.

Scelsi (S.). **Contro l'afide lanigero del melo.** [Control of the Woolly Apple Aphis.]—*Rivista di Agricoltura, Parma*, xix, no. 15, 11th April 1913, pp. 231-232.

The author quotes Professor Tamaro in advising methods for combating this pest:—(*a*) to clean carefully with a brush and wash the grafts and all apple plants of doubtful origin with Nesler's insecticide before the final planting; (*b*) to inspect the orchards in winter and early in spring and wash all infected points with the same insecticide and to plug all holes in the grafts with liquid wax, thus depriving the insects of air and killing them; (c) to lay bare the roots and examine them thoroughly and destroy all colonies found. Whenever plants are found to be infected examine them continually and carry out the cleaning processes with care and without remission, because mechanical cleaning is of more value than either the quality or the quantity of the insecticide. The formula for Nesler's insecticide is as follows:—Soft soap 40 parts, amyl alcohol 50 parts, extract of tobacco 25 parts, spirit 200 parts, and water 1,000 parts. The great advantage of this mixture is that it penetrates the waxy coating of the insects.

Black Currant Mite in Ireland.—*12th Ann. Gen. Rept. Dept. Agric. Ireland*, 1913, p. 87.

Seventy-seven cases of Black Currant Mite were reported in Ireland during the year ending 30th September 1912, and the usual notices requiring the destruction of affected bushes were served on the persons concerned.

Girault (A. A.). **A Few Fragments on *Anasa tristis*, De Geer (Hemipt.).**—*Entom. News, Philadelphia*, xxiv, no. 2, Feb. 1913, p. 56.

At Paris, Texas, a male of the Tachinid, *Trichopoda pennipes*, was reared from an adult female *Anasa* (Squash Bug) which was found to have an empty abdomen. The maggot of the parasite made no visible exit through the body of its host.

Girault (A. A.). **Notes on *Hadronotus carinatifrons*, Ashmead (Hymen.).**—*Entom. News, Philadelphia*, xxiv, no. 2, Feb. 1913, p. 57.

A mass of eggs of *Anasa tristis* (Squash Bug), at Paris, Texas, in June 1904, was observed to be parasitised by *Hadronotus carinatifrons*.

[This Chalcid was originally described from St. Vincent.—Ed.]

Brèthes (J.). **Descripción de un nuevo genero y especie de cochinilla de la Republica Argentina.** [Description of a new genus and species of Coccid from the Argentine Republic.]—*An. Mus. Nac. Hist. Nat., Buenos Aires*, xxiii (1912), 1913, pp. 279-281, 1 fig.

A new Coccid, named *Colobopyga magnani*, was discovered on the mid-rib on the under side of the leaf of the palm, *Chamaerops humilis*, at Buenos Aires.

Gallardo (A.). **La destrucción de la langosta por sus enemigos naturales.** [The destruction of the locust by its natural enemies.]—*An. Mus. Nac. Hist. Nat., Buenos Aires*, xxiii (1912), 1913, pp. 155-165.

The wholesale destruction of the migratory locust, *Schistocerca pallens*, in Yucatan, by means of the *Cocobacillus acridiorum*, discovered by F. d'Hérelle, seemed so successful, that after negotiating with the proper authorities, M. d'Hérelle was invited to introduce the parasite into Argentina.

After increasing the virulence of the cultures by inoculating locusts in succession and then isolating the contents of the intestine of the 12th series in bouillon, he commenced his experiments in the beginning of January 1912. A handful of alfalfa sprinkled with 20 ccm. of this culture was placed in a cage containing 250 to 300 locusts, with the result that after 48 hours one-half of the insects had died, and after five days all had been destroyed. The contents of the intestine were practically pure cultures of the *Cocobacillus*.

A second experiment showed that one drop of the culture was sufficient to kill four locusts immediately, 30 per cent. after 48 hours, 80 per cent. after three days, and the last locust died on the fifth day. These and other experiments led to experiments on a large scale instituted by the inspectors of the Defensa Agricola Commission in various parts of the Santa Fe Province. On the 16th January 1912, at Escalada, a swarm of locusts half an hectare in extent was sprayed with one litre of the culture liquid, applied with the Vermorel apparatus. A week later, only two per cent. survived and these eventually died on 24th January.

Two pieces of land at Matilde, each about 2 hectares in extent and infested with flying locusts, were sprayed with three litres of the *Cocobacillus* culture, resulting in a heavy mortality during the first 24 hours, and the blades of grass were dotted with the excreta of the infected specimens. After three days no living locusts were to be found.

The disease spreads with great rapidity and dead locusts infected with it were discovered fifty kilometres from the centre of distribution only a few days after the first infection. Further large-scale experiments carried on by the author in the wooded province of La Rioja proved without doubt that *Cocobacillus acridiorum* affords the most efficacious means of destroying the pest. He concludes by an appeal to the Argentine Government to show its appreciation of the immense services rendered by the National Museum of Natural History in a practical manner by a generous endowment of entomological and other scientific research.

Lime Twig Borer.—*Agric. News, Barbados*, xi, no. 284, 15th March 1913, pp. 90-91.

Towards the end of 1912 the limes in a certain district of Antigua were found to be suffering from the attack of a new pest. The branches were broken down and hanging in a dry and withered condition and a few had broken off and were lying on the ground. On examination it was found that at the point of breaking each of these branches had been neatly cut nearly all round, so that as the wood dried a very slight gust of wind was sufficient to cause it to break at the point of injury. The cause of the damage has been found to be a small Longicorn identified by the Imperial Bureau of Entomology as *Elaphidion mite*, Newm. Specimens are in the British Museum collection from St. Thomas, St. Bartholomew, St. Kitts and Guadeloupe, and it now appears that it is fairly distributed throughout the Leeward Islands. The remedy suggested is to cut off and collect all twigs and branches so attacked and burn them. Other insects which destroy the branches of trees in a similar manner are *Elaphadion villosum*, which attacks the oak in the United States and also apple-trees; but in this case, the larva after girdling the branch returns to the outer portion and falls to the ground with it. In the case of another twig girdler of the West Indies, *Oncideres amputator*, the girdling of the twig is accomplished by the parent female, the egg being laid in such a way that it will fall to the ground with the twig which is to provide food for the larva. The lime tree bark borer, *Leptostylus praemorsus*, attacks patches of dead bark on the main stem of the tree such as are often occasioned by tillage implements or bad pruning. They feed on the junction of the dead and living tissue and if the attack be sufficiently severe the entire tree may be killed from a point near the level of the ground.

Winter (W. R.). **The Fruit Fly.**—*Dept. of Agric., Bermuda,* 19th Feb. 1913, 14 pp.

In this pamphlet, which is issued by the Department of Agriculture for the benefit of fruit-growers in Bermuda, a brief statement of the life-history of *Ceratitis capitata* is given and a list of 45 fruit trees which are known to be attacked by the fly, to which grapes and mulberries must occasionally be added. Some years ago it was attempted to control the fly by hanging saucers of kerosene oil in the trees, but this was found useless, and the most efficient control in Bermuda has been found to lie in the destruction of the broods by the careful and thorough removal of all affected fruit. This should be destroyed as soon as gathered by being either burnt or boiled; or sunk in the sea in a weighted sack; on no account should it be thrown into ashbins or pits, buried, or left on the ground. The ground under all fruit trees must be kept clear of all growth, fallen leaves or fruit and other rubbish, and the surface should be loosened from time to time with a rake to a depth of two or three inches to enable the birds to get at any larvae or pupae that may be in the soil. This is stated to be a most important method of control. Spraying leaves of the fruit trees and surrounding foliage with a poisoned bait has been most successful in Italy and the Cape of Good Hope. The author gives the following mixture as having been found of practical utility in Bermuda:—Lead arsenate 1 oz., treacle or molasses 2 qts., water 1 gal. The addition of 2 or 3 tablespoonfuls of glycerine prevents the mixture from drying too readily. An abol syringe is recommended as the best for use. The fruit should be washed before being used as food.

The South African granadilla (*Passiflora edulis*), which fruits after the loquat and before the peach in Bermuda, forms an excellent trap fruit when grown on scaffolds or fences near the fruit trees; the *Ceratitis* oviposits freely in this fruit, but the eggs become encysted in the rind and never hatch. Experiments made in the autumn of 1912 at the Bermuda Agricultural Station with fruit and imitation fruit coated with tanglefoot, proved most successful, especially after the bulk of the sweet oranges had been gathered. Imitation fruit can be made by painting old tennis or other balls, eggs which have been blown, small gourds, etc., with yellow paint or enamel, and these are more satisfactory than fruit as they do not rot. When the tanglefoot becomes hardened with dust, etc., it can be washed off with methylated spirits and a fresh coat applied. The following instructions for preparing tanglefoot are given:—Castor oil 1 part by weight, powdered resin 2¼ parts by weight; dissolve the resin in the castor oil and heat and stir well during the process. It has not been found necessary to add any odorous material, such as oil of lemon, to the mixture. This form of control is most effective when the trees are in fruit and in blossom, and when the fruit is small and green. The fruit fly has been declared by the Bermuda Board of Agriculture to be an insect pest within the meaning of the Fruit Protection Act, the clauses of which affecting fruit-growers are given at length.

Townsend (C. H. T.). **On the History of Cottons and Cotton Weevils.**—*Science*, xxxvii, 25th April 1913, pp. 638-639.

Referring to his article on the Peruvian square-weevil in the Jl. of Economic Entomology for April 1911, the author believes that he has now collected sufficient palaeontological evidence for the deduction that "*Anthonomus vestitus* has probably attacked cotton in humid north-western South America for upwards of a million years, if not longer. It is therefore extremely probable that this species is not confined to Peru and Ecuador." One of the periodic separations between N. and S. America explains the fact that *A. vestitus* does not occur in N. America, and that *A. grandis* was not dispersed as far as S. America. Both the weevils have originally developed on cotton, having no other food-plant.

Root Borers and other Grubs in West Indian Soils.—*Agric. News, Barbados*, xii, no. 286, 12th April 1913, p. 122.

A root borer of sugar-cane, *Exophthalmus esuriens*, occurs in Antigua. In St. Kitts a weevil grub has been found attacking mature canes in a manner exactly similar to that in which the larvae of *Diaprepes abbreviatus* attack the same plant in Barbados. This latter insect is not known either in St. Kitts or Antigua, but the adults of *E. esuriens* are very common among the leaves of pigeon peas, castor and French silk cotton. The relationship between this weevil and the root-boring larva of the cane in the Leeward Islands has not been proved, but the evidence so far available strongly indicates that they are referable to the same species. The eggs are laid in the same manner and greatly resemble those of *Diaprepes*, but the eggs of *Exophthalmus* have not been observed on the leaves of the sugar-cane. *E. esuriens* is found in St. Kitts, Nevis, Antigua, Montserrat and Dominica. The extent of injury up to the present to sugar-cane in Antigua and St. Kitts is not known, but is possibly greater than is suspected and it is probable that when the planters learn to recognise this form of injury it will be found in many instances to account for what has in the past often been attributed to the effects of drought and the ravages of fungus disease. The insect now known as *E. esuriens* was formerly referred to in the publications of the Imperial Department of Agriculture as *Epicaerus raridus*, especially in Montserrat where it is abundant, and where it is often found feeding on the leaves of limes. The methods of control would be the same as those suggested for *Diaprepes abbreviatus* in Barbados. [*See* this *Review*, p. 98.] A large weevil, the Fiddler Beetle (*Praepodes rittatus*), attacks the orange trees in Jamaica, often girdling them and causing their death. It is said to be parasitised by a large black wasp, *Elis atrata*, of the family Scoliidae. The Golden or Orange Leaf Weevil (*Diaprepes spengleri*) is apparently only known in St. Vincent and Porto Rico. The larvae and their food habits are unknown in St. Vincent, but in Porto Rico they attack the roots of the orange, guava, avocado, mango and rose. The adult

insects feed on the leaves of limes and other citrus trees, pigeon peas, castor and several cruciferous plants. In Porto Rico young, newly planted out orange trees have been seriously damaged by this insect and spraying with arsenate of lead has been found necessary.

Outbreak of Forest Tent Caterpillar.—*Ottawa Naturalist*, xxvii, no. 1, April 1913, p. 10.

In 1912 an important outbreak of the Forest Tent Caterpillar, *Malacosoma disstria*, occurred in the Gatineau Valley, north of Ironsides. Miles of forest were devastated, the foliage of poplar and birch in particular being entirely eaten, and for a certain period trains were unable to take the grade between Ironsides and Chelsea, owing to the thousands of caterpillars on the rails.

Picard (F.). **Sur la parthénogenèse et le déterminisme de la ponte chez la Teigne des Pommes-de-terre (*Phthorimaea operculella*, Z.).** [On the parthenogenesis and oviposition of the Potato Moth (*Phthorimaea operculella*).]—*C.R. Acad. Sci., Paris*, clvi, no. 14, 1913, pp. 1097-1099.

The females of *Phthorimaea* begin to oviposit from 24 to 48 hours after copulation, 40 to 80 eggs being laid in the course of one, two or three days. The unfertilised females live much longer than the fertilised ones and sometimes lay not more than 40 eggs. Only in nine out of more than a hundred cases has the author been able to record the occurrence of parthenogenesis. The parthenogenetic larvae that were hatched developed more slowly and irregularly than the others. Altogether 23 ♀ and 21 ♂ were produced parthenogenetically in the course of the author's experiments. The results coincide with Weijenberg's observations on *Lymantria dispar*, in which species one fertilised female lays 60 times as many eggs as the parthenogenetic females. The potato moth oviposits on a great number of Solanaceous plants, but only on rugose surfaces, in cracks and depressions. The smooth-leaved flax allied to the Solanaceae is immune, whereas the unrelated but rough-leaved Cynoglossus is visited by the moth.

The caterpillar of *Phthorimaea* will starve on a tomato, but will eat boiled potato with avidity, to its own undoing. Oviposition may be stimulated by contact of the end of the abdomen with a rough surface, *e.g.*, muslin.

Picard (F.) & Blanc (G. R.). **Sur une septicémie bacillaire des chenilles d' *Arctia caja*, L.** [On a bacterial septicaemia of the caterpillars of *Arctia caja*, L.]—*C.R. Acad. Sci., Paris*, clvi, no. 17, 1913, pp. 1334-1336.

The caterpillars of *Arctia caja*, which were extremely abundant in the vineyards in the south of France this year, have been practically entirely destroyed by two diseases. One is caused by the well-known fungus, *Empusa aulicae*, the other by a new

Cocobacillus (*C. cajae*), apparently allied to *C. acridiorum*, discovered on Mexican locusts by d'Hérelle. The caterpillars become weak and emit a nauseating odour; their alimentary tract only contains a clear liquid frequently devoid of any micro-organism, while the blood contains the *Cocobacillus*, of which the authors were able to make artificial cultures in bouillon. Whether introduced by injection or ingestion the virus was sufficient to kill the caterpillars in twelve hours at 25° C. At a lower temperature (15° C.) the caterpillars died about three days after infection. Caterpillars of *Porthesia chrysorrhoea* are killed in from 24 to 48 hours, while various Coleoptera (*Hydrophilus*, *Dytiscus*, *Cybister*) and Hemiptera (*Notonecta*, *Nepa*, *Ranatra*) are immune against *C. cajae*. The white rat is immune, while the frog (*Hyla arborea*) dies of septicaemia in about two days, its blood containing numerous *Cocobacilli*, injections of which are fatal to *Arctia caja* caterpillars.

Vayssière (P.). **La Cochenille du pommier.** [The scale-insect of the apple-tree.]—*Revue de Phytopathologie*, i, no. 1, 20th April 1913, pp. 10-11.

Mytilaspis pomorum is widely distributed, having been recorded from Europe, N. and S. Africa, Canada, U.S.A., Brazil, Hawaii, Japan, New Zealand and Australia. In France the Coccid does considerable damage to pear-trees, apple-trees, willows, poplars, etc. In S. Tunisia *M. flava* attacks olive-trees, and in Greece *M. ceratoniae* destroys the carob-tree. Towards the end of August or beginning of September the female lays 40 to 100 white eggs which remain under the scale throughout the winter. During the middle of May the small white larvae spread over the trunk and branches of the tree. After six weeks the male shield is formed, and adult Coccids are common in middle of July. In spite of being destroyed in large numbers by the little Chalcidid (*Aphelinus*), by Coccinellids and by the Blue and Long-tailed Tits, artificial insecticides must be resorted to in France to check the scale. The author recommends insecticides containing paraffin oil and soft soap, *e.g.*, in the proportion of 10 parts of the former to 4 of the latter with 15 of water.

Essig (E. O.). *Scutellista cyanea*, **Motsch., bred from** *Phenacoccus artemisiae*, **Ehrh.**—*Journal of Entomology & Zoology, Claremont, Cal.*, v, no. 1, March 1913, p. 55.

Among some specimens of *Phenacoccus artemisiae*, Ehrh., collected in Ventura County, California, one was seen to be parasitised. From it an adult *Scutellista cyanea*, Motsch., was bred. The author believes that this parasite has not previously been bred from a Coccid of this type. It is interesting to note that the specimens were collected far up in the mountains, which shows that *S. cyanea* is quite common throughout all parts of Southern California. It has been bred from black scale in the mountains in other parts of Ventura County.

Whitney (B. B.). **A new Californian Coccid infesting Manzanita.** —*Journal of Entomology & Zoology, Claremont, Cal.*, v, no. 1, March 1913, pp. 50-52.

This new Coccid (*Aulacaspis manzanitae*, sp. n.) has been collected at various points in California and is invariably found on species of Manzanita at an elevation of 1,622 to 4,700 feet above sea-level.

Clement (F. M.). **Strawberry Culture and the Red Raspberry.**— *Ontario Dep. Agric. Fruit Branch*, Bull. 210, March 1913, 28 pp.

The author gives as insects specially injurious to strawberries, "white grubs" and the "strawberry leaf roller." The former is the larva of the June Beetle and lives and feeds in the ground for at least two years. If the soil be ploughed and cultivated yearly, or not allowed to remain in grass or sod for more than one year, the larvae cannot mature, as such cultivation destroys them. Growing strawberries two years in succession encourages them. Before putting land down to strawberries it is well to crop it first with corn, potatoes or roots.

The strawberry leaf roller has not proved serious, except in one case. The remedy is to spray with 3 lb. of lead arsenate in 40 gals. of water as soon as the larvae are noticed to be at work. This should be repeated at intervals, but not when the plants are in bloom or after the fruit is set.

Amongst the insect enemies of raspberries is the snowy tree cricket, which lays its eggs in the canes. It may be kept under control by cutting out and destroying the old canes in winter or early spring, but it is more or less a beneficial insect in that it feeds upon plant lice.

The raspberry cane borer makes two girdles around the cane about half an inch apart, between which the eggs are laid. The egg hatches and the larva bores down in the pith of the cane, causing the upper portion to die. The only remedy is to examine the canes and cut off the affected parts, well below the girdle.

The root borer, the larva of a clear-winged moth, appears in the root of the cane just at the surface of the ground. The largest amount of damage is done in old plantations. The only method of control is to dig out and destroy all attacked and sickly plants.

The larva of the raspberry sawfly does considerable damage by eating the tender green portions of the leaves. It can be controlled by spraying the plants with 2 lb. of lead arsenate in 40 gals. of water. If the fruit be ripe or ripening the larvae may be jarred off by hand on to the hot dust between the rows. Spraying should not be used on ripe or ripening fruit because of discoloration. White hellebore, either dusted over the plants or an infusion of it made by steeping one ounce in 2 gals. of water used as a spray, is recommended as a very good remedy.

Cotte (J.). **Un oiseau cécidophage: la mésange bleue.** [The blue tit, a gall-eating bird.]—*La Feuille des jeunes naturalistes, Paris*, no. 506, Feb. 1913, pp. 21-24.

The insect population of a cork-oak was rapidly decimated by blue-tits (*Parus coeruleus*), the stomachs of the latter containing larvae of the gall-forming *Neuroterus lanuginosus*, *N. saliens* and *Arnoldia cerris*. Other gall-eating birds are, pheasants which devour the galls of *N. quercusbaccarum* and *N. numismalis:* finches destroy the larvae of the former, while the bullfinch eats those of *Perrisia laricis*. *Diplolepsis quercus-folii*, *Cynips lignicola*, *C. kollari*, *Trigonaspis megaptera*, *Rhodites rosae* and *Andricus testaceipes* are likewise preyed on by birds.

Gibson (A.). **The Cotton Moth, *Alabama argillacea*, Hbn.**—*Canadian Entomologist*, xlv, no. 4, April 1913, p. 100.

The author notes the appearance of this moth in very large numbers during the past autumn in Western Ontario. It appeared suddenly, either late in the evening of October 10th, or early in the morning of October 11th. A figure from a photograph is given showing the characteristic habit of the moth of resting with its head downwards. The note is interesting as confirming the northward advance of this species.

Joannis (J. de). **Remarque sur un cas collectif de mimétisme chez des lépidoptères.** [Mimicry among Lepidoptera.]—*Bull. Soc. Entom. de France*, 1913, no. 5, p. 137-139.

The author has compiled a list of Lepidoptera destructive to monocotyledons cultivated in India and Java, and was struck by the fact that all these insects by coloration as well as by longitudinal markings were rendered very inconspicuous on their foodplants.

Noctuidae.—*Cirphis loreyi*, Dup., India, Java—rice, maize, sugar-cane; *C. fragilis*, Butl., India—wheat; *C. unipuncta*, Haw., India, Java—rice, oats, sorghum, sugar-cane; *Sesamia inferens*, Wlk., India, Java—maize, sugar-cane; *S. uniformis*, Dudg., India—sugar-cane, rice, sorghum, maize, wheat.

Lymantriidae.—*Laelia suffusa*, Wlk., Java—sugar-cane; *L. adara*, Moore, Java—sugar-cane; *Aroa socrus*, Hb., Java—sugar-cane; *Dasychira securis*, Hb., India, Java—rice, sugar-cane, Graminaceae.

Sphingidae.—*Leucophlebia lineata*, Westw., Java—sugar-cane.

Eupterotidae.—*Dreata petola*, Moore, Java—maize, sugar-cane, graminaceae.

Notodontidae.—*Anticyra combusta*, Wlk., Java—rice, sugar-cane.

Psychidae.—*Mahasena graminivora*, Hmp., India—cereals.

Pyralidae.—*Polyocha saccharella*, Dudg., India—sugar-cane; *Anerastia ablutella*, Z., India—sugar-cane; *Schoenobius bipunctiferus*, Wlk., Java—rice; *Scirpophaga excerptalis*, Wlk., India—

sugar-cane; *S. auriflua*, Z., India, Java—sugar-cane; *S. monostigma*, Z., India, Java—sugar-cane; *Diatraea venosata*, Wlk., Java—sugar-cane; *Chilo simplex*, Butl., India—maize, sorghum, sugar-cane; *C. auricilia*, Dudg., India—rice, sugar-cane; *C. infuscatellus*, Snell., Java—sugar-cane; *Ancylolomia chrysographella*, Koll., India—rice, Graminaceae; *Nymphula fluctuosalis*, Z., India—rice; *N. depunctalis*, Gn., India, Java—rice; *Cnaphalocrocis medinalis*, Gn., India, Java—rice; *Marasmia trapezalis*, Gn., India, Java—maize, sorghum, sugar-cane; *Pyrausta cochlesalis*, Wlk., India, Java—bamboo, sugar-cane.

Jones (C. R.). **The Cigarette Beetle (*Lasioderma serricorne*, Fabr.) in the Philippine Islands.**—*Philippine Jl. of Science*, viii, D, i, Feb. 1913, pp. 1-42, 9 plates.

The decrease in the exportation of tobacco and its products from the Philippines to the United States from 4,023,404 pesos in 1910 to 1,483,544 pesos in 1911 is undoubtedly to a large extent due to *Lasioderma serricorne*, F. The annual loss of cigars in Manila amounts to about 6,000-13,000 pesos ($3,000-6,500) per factory. A knowledge of the habits of this pest is, therefore, of great economic importance. The beetle occurs in all the principal tropical and sub-tropical tobacco-producing districts, and in Cuba and the Philippines is abundant at any season of the year.

It has been found breeding in raisins, rhubarb, cayenne pepper, rice, ginger, dried fish, upholstery, ergot, turmeric, books, cane-work, gun-wads, liquorice, belladonna, saffron, in pyrethrum powder strong enough to kill cockroaches, and in 1895 did great damage to herbarium specimens in Washington. The chief damage, however, is done by the small holes it eats through the wrappers of cigars and cigarettes. The whitish, tough-shelled egg is deposited singly in crevices of leaf tobacco, most frequently along the midrib, or within the open tip of the cigar or cigarette, and is most difficult to detect.

The incubation period varies considerably in the Philippines, the average being six days. It has been shown experimentally that only 5 per cent. fail to hatch. The size of the beetle depends on the quality as well as on the quantity of food obtained by the larva; in every case beetles obtained from selected cigars were double the size of those from bales of low-grade tobacco. Also the infestation first appears in the *claro* cigars and Turkish cigarettes, while cheap-grade tobacco and *maduro* cigars often remain in the factories from one to two years without becoming infested. Eggs, larvae, pupae and adults are found in tobacco factories and warehouses throughout the year, but the greatest abundance of adults seems to occur in March and April. The adults themselves appear to do no damage.

A Clerid has been observed which is predaceous on the larvae and pupae of *L. serricorne* and six adult Clerids devoured 31 in a single night. A Chalcidid of the genus *Norbanus* lays a single egg in the pupa of the beetle. A far less effective parasite is a small white mite of the genus *Rhagidia* which attacks the beetle in all stages except the adult.

Many points have to be considered in combating the cigarette beetle. All the tobacco becomes infested in the piles or *mandalas* in which fermentation takes place in the curing process, and as the development of the beetle is continuous throughout the year, the manufactured tobacco is largely infested with eggs. It is important that the agencies used to destroy the cigarette beetle should not alter the aroma and other characteristics of the tobacco. In Manila, hydrocyanic acid gas and carbon bisulphide are commonly used for fumigation, as, provided the necessary precautions are taken, no appreciable deterioration in the quality of the cigar and, according to laboratory experiments, no injurious effects on the consumer are noticeable. Habitual smokers were unable to notice a difference between treated and untreated tobacco. A room in the factory is set aside for fumigating and the tobacco is treated there in the leaf. The cigars are afterwards guarded in this room against reinfestation. Work-rooms in which the drying, selecting, boxing and labelling of cigars takes place may be absolutely protected, once all the stages of the beetle have been eliminated, by covering doors and windows with wire screens, not coarser than 10 meshes to one centimetre. All manufactured products should be kept in tin-lined boxes, instead of being piled on the floor. The cost of treating leaf-tobacco in fumigation-compartments in Manila is 2·06 pesos (4*s.* 3*d.*) for 1,400 kilograms (3,080 lb.) with hydrocyanic acid gas and 15 centavos (3¾*d.*) per thousand cigars with carbon bisulphide. Tables showing the volumes of the gas required and their effect on eggs, larvae and adults are given.

Where cigar and cigarette factories are equipped with boilers and machinery, subjecting tobacco to steam is a useful way of annihilating the *Lasioderma*. It has been found that moist heat between 60° and 90° is sufficient to kill the insect in all its stages within half an hour. Care must be taken to avoid excessive moisture and mould, and to place high grade wrapper leaves in the centre of the steaming drum, as they are liable to become somewhat dark and brittle. Where a cold storage plant is available, it is found that at a temperature of 8° C. the beetle in all its stages can be killed in four days. At a temperature of between 8° and 14° C. the vitality of the larva, pupa and adult is seriously impaired. After stating the cost of all these remedial measures the author discusses the relative merits of a light and petroleum trap and a trap consisting of tobacco 'manos,' much to the favour of the latter. The results of analyses showing the yield of hydrocyanic acid from cigars treated with the gas to be negligible, and some excellent photographs illustrating the ravages of the beetle conclude the paper.

Vuillet (A.). **Acclimatation du *Novius cardinalis* dans le Midi de la France.** [Acclimatisation of *Novius cardinalis* in the South of France.]—*Revue de Phytopathologie*, i, no. 1, 20th April 1913, pp. 8-10.

In 1910 *Icerya purchasi*, a native of Australia, which in 1880 threatened to annihilate the orange and citrus ranches in California, and has since appeared in Florida, S. Africa, Egypt,

Hawaii, Portugal and Italy, was imported from the latter country to the South of France. It speedily spread in the beautiful gardens on Cap Ferrat (Alpes-Maritimes), until it was found necessary to check its progress by the same method which made the *Icerya* practically harmless in the countries mentioned, namely, by the introduction of the Coccinellid, *Novius cardinalis*. As only seven specimens of the latter insect, sent from the Station of Economic Entomology at Portici, were available, they were first allowed to multiply in a specially constructed cage. They were released in the middle of August last year, and when the author returned to Cap Ferrat in February, it appeared that the scale, though subsisting on various food-plants (Citrus, Acacia, Pittosporum, etc.), was no longer dangerous and that larvae, nymphs and adults of *Novius* were to be found throughout the gardens on the peninsula.

Gaumont (L.). **Le puceron de la betterave.** [The Beet Aphis.]—*Revue de Phytopathologie*, i, no. 1, 20th April 1913, pp. 12-13.

In 1911, particularly, the beet-crops in France were much diminished owing to the ravages of *Aphis euonymi*. The pest was likewise reported from Poland and Hungary in 1909. The eggs, sexually produced by apterous females fertilised by winged males, are deposited in the bud-axils of the European and Japanese spindle-tree. They hatch in April, the females (fondatrices) giving rise to the 'emigrant' generations which attack the sugar and white beet. To destroy *Aphis euonymi* Jablonowski recommends spraying the shrubs infested with eggs with an emulsion consisting of 20 litres of paraffin oil, 10 litres of water and 1¾ kilogs. of soap. Prof. Malaquin of Lille advises the destruction of the adults on the beet with a spray made from 1 kilog. soft soap, 1 kilog. soda and 1 litre of paraffin oil in 100 litres of water, all perfectly mixed. A 2 per cent. solution of the tobacco extract sold in Budapest under the name of 'Thaneton,' effectively destroys the aphis on the plants grown for seed without damaging the latter.

Townsend (C. H. T.). **Muscoid Parasites of the Cotton-Stainer and other Lygaeids.**—*Psyche*, xx, no. 2, April 1913, pp. 91-94.

Four species of Muscid parasites of Lygaeidae have so far been discovered. Neilson recorded a Muscid maggot (snylteflueart) in the abdomen of an adult *Lygaeus saxatilis* in Sicily. The three other species were found by the author in Peru. *Xanthomelanodes peruanus*, Towns., was found in *Stenomacra* sp. near *limbatipennis*, Stal., in the Piura Valley. The cotton stainers, *Dysdercus ruficollis*, L., were plentiful on cotton in the Chira and Piura Valleys and were parasitised by the Muscid *Acaulona peruviana*, sp. n., which in its turn was parasitised by a *Perilampus*. The fourth species, also found on *Dysdercus ruficollis*, could not be determined, as the puparium probably dried up; it was evident, however, that the parasite belonged to a genus quite distinct from *Acaulona* and *Xanthomelanodes*.

Picard (F.). **La lutte contre l'altise dans l'Hérault.** [The struggle against *Haltica* in Hérault.]—*Bull. Agric. d'Algérie et de la Tunisie*, no. 4, 15th Feb. 1913, pp. 86-89.

The most active predaceous enemy of the *Haltica* is *Zierona caerulea* (the Blue Bug) and wherever the beetle is found this insect accompanies it. It winters with it and appears at the same time of year, its voracity being such that it will eat ten larvae per diem. It will also attack the adult insect and has been known to suck their eggs. The parasitic insects are of even greater importance; amongst them are the Braconid *Perilitus brevicollis*, and a Tachinid, *Degeeria funebris*, the former parasitising the larvae and the latter the perfect insect. This Tachinid has been found in the Lyonnais and in the South by H. Sicard. There are two generations in the year and each of these lays its eggs in the adults of the corresponding generation of the *Haltica*, never attacking the larvae, and even if the insect be not absolutely killed its reproductive organs are invariably destroyed. It has been found that in certain years 85 per cent. of the *Haltica* are parasitised in this way. The author says that among the fungi a Hyphomycetous species, *Sporotrichum* (*Beauveria*) *globuliferum*, is one of the principal enemies of *Haltica* and has been used against the Chinch Bug (*Blissus leucoptera*) in the United States. Trabut experimented with it against *Haltica* in Algeria with great success during the winter of 1911-12. The great majority of the *Haltica* in Hérault were destroyed by this fungus disease, and as a result their attack in the following spring was relatively slight, contrary to what had been prophesied. The warm, wet winter undoubtedly had a great effect in assisting the development of the fungus. Amongst methods still in use in Hérault is that of collecting the adult insects by means of an apparatus known as "l'entonnoir à Altises" (*Haltica* funnel) which is held underneath the branches, the insects being shaken into it, and passing out into a sack attached to the other end. This operation should be performed early in the morning when the insects have not properly recovered from the cool of the previous night and are incapable of springing far. One method of diminishing the cost of the labour required for carrying out this process is to powder the vines with sulphur or fine chalk: this causes the *Haltica* to gather together in certain parts of the plant so that a large number may be captured by one application of the funnel. Another plan is to distribute over the vineyards artificial shelters made of the straw covers of bottles, bundles of twigs and the like, in which the *Haltica* collect and may be captured in quantities. This plan is most useful in winter. The author says that the method which combines a maximum of economy and efficaciousness consists in the employment of the insecticide in the spring, between the time of the appearance of the insect and that at which it begins to lay its eggs. He advises the following mixture as one of the best:—acetate of lead, 600 grammes; arsenate of soda, 200 grammes; water, 100 litres. This mixture may be used

separately or combined with bouillie bordelaise. The question as to whether the *Haltica* is really poisoned by the arsenate is possibly still a matter of doubt, but the practical result is the same. The insect leaves the plant and dies, possibly of hunger, but the leaves are not touched and no eggs are laid. Nicotine is said to give good results in the Gironde, but the author is of opinion that it protects the leaves in a less effective manner than arsenical compounds. He says that spraying against the second generation is much less efficacious, especially as arsenical compounds must not be used. Fortunately this second treatment is generally unnecessary, in that the summer brood is much less abundant than that of the spring and cannot do anything like the same amount of damage, because the insects are spread over a much larger leaf surface. If, however, the attack is of sufficient gravity, nicotine spray is the remedy, or possibly barium chloride, but under no conditions are arsenical compounds to be used.

Chappelle. **La lutte contre la Mouche de l'Olive; résultat des experiences du Service de l'Oléiculture (Année 1912).** [The fight against the Olive fly; results of experiments of the Olive Department for the year 1912.] — *Bull. Agric. de l'Algérie et de la Tunisie*, no. 5, 1st March 1913, pp. 100-104.

The experiments here reported upon were made in an olive grove which contained 10,000 trees, situated at a great distance from other olive groves and in a position peculiarly favourable to the attack of the fly, and more or less notorious for the intensity of such attacks and, further, it contained a great number of trees of the variety known as "saurine," which are said to be particularly affected by the fly. The trees were first sprayed on the 8th July when the fruit was only a few millimetres in diameter and no flies whatever could be found. The mixture used was composed of 50 kilos. of a 2½ per cent. solution of arsenate of soda in 100 litres of water. This spray could only be regarded as a preventive. The author says that one man, properly equipped, was able to spray 700-900 trees of medium size in a day. The summer was relatively cold and rainy, and during the months of July and August, several violent rain storms occurred, so that by the end of August no trace was left of the first spraying. The trees were sprayed again on 6th September, only two-thirds being treated, with the result that, whilst the pest attacked the whole countryside with most disastrous effects, it was found that the number of trees attacked in that part of the plantation which had been treated was quite insignificant.

The author give a table showing the varieties of olive and the percentage attacked in the olive grove under observation and in others which were not treated. The general result is that on the 5th October, when the examination was made, it was found that in the plantation experimented upon more than 95 per cent. of the trees escaped, whereas in others which had not been

treated the figure was only a little over 40 per cent, and in some cases by the 5th November it had fallen as low as 14½ per cent.

The attack of *Dacus* results not only in the premature dropping of the fruit, but also causes a very serious diminution in the yield of oil. Figures are given to show that the ratio of the yield from the treated olive groves and others was about 5 to 3. The cost of the treatment is estimated at about 5 centimes for each tree or from 7 to 10 francs a hectare (2½ acres).

Figures are also given showing the great effect produced by omitting treatment of the trees for one year, the proportion of olives attacked in that year being more than double. The author inclines to the opinion that spraying is the only remedy which is really effective, and that this should be done a first time in the beginning of July and a second in the early days of September; but in other olive-growing districts, as in the Alpes-Maritimes and Corsica, it would be wise to watch the development of the parasite and, if necessary, to give a thin spraying in the autumn. He does not disguise the fact that the conditions under which the experiments were made were extremely favourable to their success, but he feels assured that even under less favourable conditions the action of sprays is unquestionable and the expense more than justified.

Jones (P. R.) & Davidson (W. M.). **Life-history of the Codling Moth in the Santa Clara Valley of California.**—*U.S. Dept. Agric., Bureau of Entomology*, Bull. no. 115, part iii, 18th Jan. 1913, pp. 111-181, 13 figs.

The following is a brief summary of the life-cycle of the codling moth in the apple and pear orchards of the Santa Clara Valley (Cal.). The overwintered larvae pupate from the middle of February until May, the moths issuing about six weeks later through a period extending from the latter part of March until the middle of June. Eggs are deposited about 3 days after emergence, and hatch in about 12 days. The first-brood larvae enter the fruit shortly after hatching and remain there for about 5 weeks. They may be found in the fruit from the last week in April until the last week in July, a range of 3 months, or nearly three times their average larval life. After leaving the fruit the full-grown larva seeks some crevice in the bark on the main trunk or on the larger limbs of the tree and there spins its cocoon, transforming after a few days into a pupa. The first-brood pupal stage averages 21 days, only half as long as the corresponding stage of the spring brood, a fact due, undoubtedly, to the considerably higher temperature. First-brood pupae are present from about the middle of June until the middle of September, although the two years 1910 and 1911 show a considerable diversity on this point; for in 1910, the warmer of the two years, the first-brood pupae were present three weeks earlier. Similarly the first-brood moths emerged just so much earlier in 1910. A fair proportion of the first-brood pupae hibernate, so

that individuals may remain in the immature stages for 10 or 11 months. The first-brood moths begin to deposit eggs 3 days after issuing, and these eggs hatch in 11 to 13 days. The second-brood larvae remain in the fruit about 50 days, and they may be found from the latter half of July until the middle of October, a period of about 80 days. All larvae of the second brood hibernate and form the great bulk of overwintering larvae. Doubtless if the fruit remained longer on the tree there would be a complete second brood possible; but so many varieties of apples and pears are picked before the end of September.

Observations indicate that the weather does not always exert great influence on the relative sizes of the two generations; nor are the numbers of the second necessarily influenced by those of the first. The relative number of larvae of the first brood that overwinter varies from year to year, but this is not entirely owing to the influence of the weather or the temperature. The larvae of the second brood are present in all but the earliest varieties of fruit, and it is necessary to combat them. Weather conditions exert more influence on the spring emergence of moths than on the summer emergence.

Three applications of poison spray are necessary for the control of the codling moth in this locality. The first should be made immediately after the petals have dropped from the blossoms, the second should follow from 2 to 4 weeks later, and the third a month or 6 weeks after the second.

Scott (E. W.) & Siegler (E. H.). **Lime-sulphur as a Stomach Poison for Insects.**—*U.S. Dept. Agric., Bureau of Entomology, Bull.* no. 116, pt. iv, 17th Jan. 1913. pp. 81-90, 1 pl.

In 1912 a series of feeding experiments were undertaken by the branch of Deciduous Fruit Insect Investigations of the Bureau of Entomology, at its laboratory at Benton Harbor, Mich., to test the killing effect of various poisons on different species of insects. It was soon found that lime-sulphur, hitherto considered only as a contact spray, has decided value as a stomach poison, especially in the case of the fall web-worm and the codling moth. It is probable that caterpillars of mandibulate insects in general will be susceptible to lime-sulphur alone, or lime-sulphur in conjunction with lead arsenate.

Twigs of the wild black cherry (*Prunus serotina*) were sprayed with these chemicals until the leaves began to drip. After the spray had thoroughly dried, larvae of the fall web-worm (*Hyphantria cunea*, Drury) were placed on the leaves, and a large paper bag was put over each twig. Periodical examinations were made, and the dead larvae were taken out and counted. When all the insects were dead or had pupated the amount of foliage consumed was measured by means of a celluloid sheet cross-sectioned to one-hundredth of a square inch. Experiments were also made with a limited number of pear-slug larvae (*Eriocampoides cerasi*, L.)

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